Vertical Motion Options

There are five different vertical motion options. The suggested default is to use the vertical velocity field that is included with most meteorological data. Other options may be required for special situations such as following the transport of a balloon on a constant density surface, comparing isobaric flow fields between data sets, or situations when the meteorological data's vertical velocity field may be too noisy compared with the time step at which the data are available (high spatial resolution simulations).

Vertical: ○ 0:data ○ 1:isob ● 2:isen ○ 3:dens ○ 4:sigma

In the sigma option the trajectory remains on its original sigma surface. In the isobaric, isentropic, and constant density (isopycnic) options, the vertical velocities are computed from the equation, $W = (-\partial q/\partial t - u\, \partial q/\partial x - v\, \partial q/\partial y) / (\partial q/\partial z)$, where "W" is the velocity required for the trajectory to remain on the "q" surface (pressure, potential temperature, density). Note that the equation results in only an approximation of the motion and a trajectory may drift from the desired surface. Shown below left is the same trajectory of the previous example using the ECMWF vertical velocity fields. To the right is the same trajectory computed using the isentropic flow assumption, showing that the potential temperature varied by only about 1 degree. This illustrates that under adiabatic flow conditions the two trajectory methods should give comparable results.